CLAIMS

1. A network system, comprising:

a plurality of nodes;

wherein each node in the plurality of nodes is coupled to communicate with at least one other node in the plurality of nodes; and

wherein each node of the plurality of nodes comprises a plurality of queues and is operable to perform the steps of:

receiving a plurality of packets;

for each received packet in the plurality of packets, coupling the received packet into a selected queue in the plurality of queues, wherein a respective selected queue is selected in response to the respective received packet satisfying one or more criteria; and

assigning a weight to each respective queues in the plurality of queues, wherein each weight assigned to a respective queue in the plurality of queues is responsive to quality requirements for each packet in the respective queue and to a ratio of packet arrival variance in the respective queue and a mean of packets arriving to be stored in the respective queue during a time interval.

2. The system of claim 1 wherein, for each queue in the plurality of queues:

the weight assigned to the respective queue comprises a weight W_x;

the ratio for a respective queue comprises a value IDC_x; and

wherein each weight in the plurality of weights is optimized in response to minimizing a sum of a product of each weight W_x with its respective value IDC_x.

3. The system of claim 1 wherein each node of the plurality of nodes is further operable to perform the step of scheduling transmission of packets from each queue of the plurality of queues in response to a respective weight, from the plurality of weights, assigned to the queue.

4. The system of claim 1 wherein each received packet comprises an IP packet and wherein the quality requirements comprise QoS.

5. The system of claim 1:

wherein each packet in the plurality of packets comprises a respective packet header; and

wherein the one or more criteria are evaluated relative to information in the packet header.

6. The system of claim 5 wherein the one or more criteria are selected from a set consisting of source address, destination address, protocol field, type of service field, and source/destination port numbers.

7. The system of claim 5:

wherein each weight is responsive to quality requirements by responding to effective bandwidth *Eb*;

wherein *Eb* is defined as: $Eb = \frac{1}{st} \cdot \log \mathrm{E}\left[e^{(s \cdot A_t)}\right]$;

wherein A_t is an amount of incoming work in duration of *t*; and

wherein *(s, t)* are space and time parameters, respectively, which characterize an operating point at a link to the node.

8. The system of claim 1:

wherein each weight is responsive to quality requirements by responding to effective bandwidth *Eb*;

wherein *Eb* is defined as: $Eb = \frac{1}{st} \cdot \log \mathrm{E}\left[e^{(s \cdot A_t)}\right]$;

wherein A_t is an amount of incoming work in duration of *t*; and

wherein *(s, t)* are space and time parameters, respectively, which characterize an operating point at a link to the node.

9. The system of claim 1 wherein the network comprises an internet protocol network.

10. The system of claim 1 wherein the internet protocol network comprises the global internet.

11. The system of claim 1 wherein each node of the plurality of nodes is selected from a set consisting of a router and a switch.

12. The system of claim 1 wherein each node of the plurality of nodes is selected from a set consisting of an edge router and a core router.

13. The system of claim 1 wherein, for each queue in the plurality of queues:

the weight assigned to the respective queue comprises a weight W_x;

the ratio for a respective queue comprises a value IDC_x; and

wherein each weight in the plurality of weights is optimized in response to minimizing a sum of a product of each weight W_x with its respective value IDC_x; and

wherein each node of the plurality of nodes is further operable to perform the step of scheduling transmission of packets from each queue of the plurality of queues in response to a respective weight, from the plurality of weights, assigned to the queue.

14. The system of claim 13:

wherein each weight is responsive to quality requirements by responding to effective bandwidth *Eb*;

wherein *Eb* is defined as: $Eb = \frac{1}{st} \cdot \log \mathrm{E}\left[e^{(s \cdot A_t)}\right]$;

wherein A_t is an amount of incoming work in duration of *t*; and

wherein *(s, t)* are space and time parameters, respectively, which characterize an operating point at a link to the node.

15. The system of claim 14:

wherein each weight responds to the effective bandwidth *Eb* by being greater than or equal to a ratio of the effective bandwidth *Eb* to a total bandwidth available to the node; and

wherein a total for all weights for all queues in the plurality of queues equals one.

16. A method of operating a node in a plurality of nodes in a network system, wherein each node in the plurality of nodes is coupled to communicate with at least one other node in the plurality of nodes, the method comprising:

receiving a plurality of packets;

for each received packet in the plurality of packets, coupling the received packet into a selected queue in a plurality of queues in the node, wherein a respective selected queue is selected in response to the respective received packet satisfying one or more criteria; and

assigning a weight to each respective queues in the plurality of queues, wherein each weight assigned to a respective queue in the plurality of queues is responsive to quality requirements for each packet in the respective queue and to a ratio of packet arrival variance in the respective queue and a mean of packets arriving to be stored in the respective queue during a time interval.

17. The method of claim 16 wherein, for the assigning step:

the weight assigned to the respective queue comprises a weight W_x;

the ratio for a respective queue comprises a value IDC_x; and

wherein each weight in the plurality of weights is optimized in response to minimizing a sum of a product of each weight W_x with its respective value IDC_x.

18. The method of claim 16 and further comprising the step of scheduling transmission of packets from each queue of the plurality of queues in response to a respective weight, from the plurality of weights, assigned to the queue.

19. The method of claim 16 wherein each received packet comprises an IP packet and wherein the quality requirements comprise QoS.

20. The method of claim 19:

wherein each weight is responsive to quality requirements by responding to effective bandwidth *Eb*;

wherein *Eb* is defined as: $Eb = \frac{1}{st} \cdot \log \mathrm{E}\left[e^{(s \cdot A_t)}\right]$;

wherein A_t is an amount of incoming work in duration of *t*; and

wherein *(s, t)* are space and time parameters, respectively, which characterize an operating point at a link to the node.

21. The method of claim 16:

wherein each weight is responsive to quality requirements by responding to effective bandwidth *Eb*;

wherein *Eb* is defined as: $Eb = \frac{1}{st} \cdot \log \mathrm{E}\left[e^{(s \cdot A_t)}\right]$;

wherein A_t is an amount of incoming work in duration of *t*; and

wherein *(s, t)* are space and time parameters, respectively, which characterize an operating point at a link to the node.

22. The method of claim 21:

wherein each weight responds to the effective bandwidth *Eb* by being greater than or equal to a ratio of the effective bandwidth *Eb* to a total bandwidth available to the node; and

wherein a total for all weights for all queues in the plurality of queues equals one.

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